We claim:

1. A process for manufacturing a solid oxide fuel cell, the process comprising:

forming a plastic mass comprising a mixture of an electrolyte substance and an electrochemically active substance;

extruding the plastic mass through a die to form an extruded tube; and

sintering the extruded tube to form a tubular anode capable of supporting the solid oxide fuel cell.

2. A process according to claim 1, further comprising, after sintering the extruded tube, layering an electrolyte onto the tubular anode.

3. A process according to claim 2, further comprising, after layering the electrolyte, layering a cathode onto the electrolyte.

4. A process according to claim 3, further comprising:

reducing an oxide of an electrochemically active substance in the anode, to form pores.

5. A process according to claim 4, wherein reducing the oxide of the electrochemically active substance comprises flowing a reducing gas over a surface of the anode.

6. A process according to claim 5, wherein reducing the oxide of the electrochemically active substance comprises flowing hydrogen gas over the surface of the anode at a temperature between 800°C and 1000°C.

7. A process according to claim 3, further comprising:

milling a catalyst with the electrochemically active substance.

8. A process according to claim 7, wherein the catalyst comprises a material chosen from the group consisting of: CeO_2, ruthenium, rhodium, rhenium, palladium, scandia, titania, vanadia, chromium, manganese, iron, cobalt, nickel, zinc, and copper.

9. A process according to claim 8, wherein the catalyst comprises CeO_2 in a proportion of between 1% and 3% by weight.

10. A process according to claim 3, wherein forming a plastic mass comprises forming a mass comprising a mixture of stabilized zirconia and nickel oxide.

11. A process according to claim 10, wherein layering the electrolyte comprises spraying a stabilized zirconia electrolyte onto the tubular anode.

12. A process according to claim 10, wherein layering the electrolyte comprises dip-coating a stabilized zirconia electrolyte onto the tubular anode.

13. A process according to claim 10, wherein layering the cathode comprises spraying a strontia-doped lanthanum manganite cathode onto the electrolyte.

14. A process according to claim 10, wherein the layering the cathode, after layering the electrolyte, and after sintering the anode, comprises forming a tubular fuel cell in which a thickness of the anode comprises over 50% of a total thickness of the anode, the electrolyte, and the cathode.

15. A process according to claim 1, wherein sintering comprises forming a tubular anode with a thickness in the range of 300μm to 400μm.

16. A process according to claim 3, wherein the tubular anode comprises a uniform ratio of electrochemically active substance to electrolyte substance.

17. A process according to claim 16, wherein the anode comprises a volume percentage of nickel of between 40% and 50%.

18. A process according to claim 3, wherein the process further comprises co-extruding more than one anode layer to form the tubular anode.

19. A process according to claim 18, wherein each of the anode layers comprises a ratio of electrochemically active substance to electrolyte substance, and wherein such ratios are higher for layers that are layered further from a surface of the anode that contacts a fuel gas than for layers that are layered closer to the fuel gas.

20. A process according to claim 19, wherein the electrochemically active substance is nickel and the electrolyte substance is stabilized zirconia.

21. A process according to claim 19, wherein there are two anode layers.

22. A process according to claim 19, wherein there are more than two anode layers.

23. A process according to claim 18, wherein the more than one anode layers comprise a thicker support layer and a thinner active layer, the support layer being in contact with a fuel gas.

24. A process according to claim 23, wherein the support layer comprises a higher ratio of stabilized zirconia to nickel, and wherein the active layer comprises a lower such ratio.

25. A process according to claim 23, wherein the support layer comprises from 0% to 50% nickel by volume.

26. A process according to claim 23, wherein the active layer comprises from 40% to 45% nickel by volume.

27. A process according to claim 23, wherein the process comprises extruding the active layer around a current-collecting wire.

28. A process according to claim 23, wherein the support layer comprises aluminum oxide.

29. A process according to claim 1, wherein the extruded tube has a non-circular cross-section.

30. A process for manufacturing a solid oxide fuel cell, the process comprising:

forming first and second plastic masses, each plastic mass comprising a mixture of an electrolyte substance and an electrochemically active substance, the first plastic mass having a higher relative content ratio of electrochemically active substance to electrolyte substance, and the second plastic mass having a lower relative content ratio of electrochemically active substance to electrolyte substance;

extruding the first plastic mass through a die to form a first extruded tube;

extruding the second plastic mass through a die to form a second extruded tube;

fitting the first extruded tube inside the second extruded tube to form a combined tube; and

sintering the combined tube to form a tubular anode capable of supporting the solid oxide fuel cell.

31. A process according to claim 30, wherein the process comprises forming first and second plastic masses, each plastic mass comprising a mixture of stabilized zirconia and nickel oxide, the first plastic mass having a higher relative content ratio of nickel oxide to stabilized zirconia, and the second plastic mass having a lower relative content ratio of nickel oxide to stabilized zirconia.

32. A tubular solid oxide fuel cell comprising:

a cathode;

an electrolyte; and

a tubular anode capable of supporting the fuel cell.

33. A fuel cell according to claim 32, wherein the anode comprises a mixture of stabilized zirconia and nickel.

34. A fuel cell according to claim 33, wherein the electrolyte comprises stabilized zirconia.

35. A fuel cell according to claim 32, wherein the cathode comprises a strontia-doped lanthanum manganite.

36. A fuel cell according to claim 33, wherein the cathode comprises a strontia-doped

lanthanum manganite.

37. A fuel cell according to claim 34, wherein the cathode comprises a strontia-doped lanthanum manganite.

38. A fuel cell according to claim 32, wherein a thickness of the anode comprises over 50% of a total thickness of the anode, the electrolyte, and the cathode.

39. A fuel cell according to claim 32, wherein the anode has a thickness in the range of 300μm to 400μm.

40. A fuel cell according to claim 32, wherein the anode comprises a catalyst material chosen from the group consisting of: CeO_2, ruthenium, rhodium, rhenium, palladium, scandia, titania, vanadia, chromium, manganese, iron, cobalt, nickel, zinc, and copper.

41. A fuel cell according to claim 40, wherein the catalyst comprises CeO_2 in a proportion of between 1% and 3% by weight.

42. A fuel cell according to claim 32, wherein the anode comprises a volume percentage of nickel of between 40% and 50%.

43. A fuel cell according to claim 32, wherein the anode comprises more than one anode layer, each layer having a different composition.

44. A fuel cell according to claim 43, wherein each of the anode layers comprises a ratio of electrochemically active substance to electrolyte substance, and wherein such

ratios are higher for layers that are layered further from a surface of the anode that contacts a fuel gas than for layers that are layered closer to the fuel gas.

45. A fuel cell according to claim 44, wherein the electrochemically active substance is nickel and the electrolyte substance is stabilized zirconia.

46. A fuel cell according to claim 44, wherein there are two anode layers.

47. A fuel cell according to claim 44, wherein there are more than two anode layers.

48. A fuel cell according to claim 43, wherein the more than one anode layers comprise a thicker support layer and a thinner active layer, the support layer being in contact with a fuel gas.

49. A fuel cell according to claim 48, wherein the support layer comprises a higher ratio of stabilized zirconia to nickel, and wherein the active layer comprises a lower such ratio.

50. A fuel cell according to claim 48, wherein the support layer comprises from 0% to 50% nickel by volume.

51. A fuel cell according to claim 48, wherein the active layer comprises from 40% to 45% nickel by volume.

52. A fuel cell according to claim 48, wherein the active layer comprises an embedded current-collecting wire.

53. A fuel cell according to claim 48, wherein the support layer comprises aluminum oxide.

54. A fuel cell according to claim 32, wherein the tubular anode has a non-circular cross-section.

55. An electrode-supported oxygen pump, the oxygen pump comprising:
a first tubular electrode layer capable of supporting the oxygen pump;
an electrolyte layer, layered on the first electrode layer; and
a second tubular electrode layer layered on the electrolyte layer.

56. An oxygen pump according to claim 55, wherein the first tubular electrode layer comprises an electrolyte substance mixed with a precious metal.

57. An oxygen pump according to claim 56, wherein the precious metal is chosen from the group consisting of: platinum, palladium, silver, rhodium, and rhenium.

58. An oxygen pump according to claim 56, wherein the electrolyte substance comprises stabilized zirconia.

59. An oxygen pump according to claim 55, wherein the first tubular electrode layer comprises a porous perovskite substance.

60. An oxygen pump according to claim 59, wherein the perovskite substance is chosen from doped $LaCoO_3$ and doped $La[CoFe]O_3$.

61. An oxygen pump according to claim 55, wherein the electrolyte layer comprises

stabilized zirconia.

62. An oxygen pump according to claim 55, wherein the electrolyte layer comprises a thinner layer of stabilized zirconia and a thicker porous support layer.

63. An oxygen pump according to claim 62, wherein the support layer comprises alumina.

64. An oxygen pump according to claim 55, wherein the electrolyte layer comprises a doped oxide, the oxide being chosen from the group consisting of: cerium oxide, lanthanum oxide, bismuth oxide, yttrium oxide, and lead oxide.

65. An oxygen pump according to claim 55, wherein the electrolyte layer comprises a porous perovskite.

66. An oxygen pump according to claim 65, wherein wherein the perovskite substance is chosen from doped $LaCoO_3$ and doped $La[CoFe]O_3$.

67. An electrode-supported oxygen sensor, the oxygen sensor comprising:
a first tubular electrode layer capable of supporting the oxygen sensor;
an electrolyte layer, layered on the first electrode layer; and
a second tubular electrode layer layered on the electrolyte layer.

68. An oxygen sensor according to claim 67, wherein the first tubular electrode layer comprises an electrolyte substance mixed with a precious metal.

69. An oxygen sensor according to claim 68, wherein the precious metal is chosen

from the group consisting of: platinum, palladium, silver, rhodium, and rhenium.

70. An oxygen sensor according to claim 68, wherein the electrolyte substance comprises stabilized zirconia.

71. An oxygen sensor according to claim 67, wherein the first tubular electrode layer comprises a porous perovskite substance.

72. An oxygen sensor according to claim 71, wherein the perovskite substance is chosen from doped $LaCoO_3$ and doped $La[CoFe]O_3$.

73. An oxygen sensor according to claim 67, wherein the electrolyte layer comprises stabilized zirconia.

74. An oxygen sensor according to claim 67, wherein the electrolyte layer comprises a thinner layer of stabilized zirconia and a thicker porous support layer.

75. An oxygen sensor according to claim 74, wherein the support layer comprises alumina.

76. An oxygen sensor according to claim 67, wherein the electrolyte layer comprises a doped oxide, the oxide being chosen from the group consisting of: cerium oxide, lanthanum oxide, bismuth oxide, yttrium oxide, and lead oxide.

77. An oxygen sensor according to claim 67, wherein the electrolyte layer comprises a porous perovskite.

78. An oxygen sensor according to claim 77, wherein the perovskite substance is chosen from doped $LaCoO_3$ and doped $La[CoFe]O_3$.

79. A method of manufacturing an oxygen pump, the method comprising:
extruding a first tubular electrode, capable of supporting the oxygen pump;
layering an electrolyte layer on the first tubular electrode; and
layering a second tubular electrode on the electrolyte layer.

80. A method according to claim 79, wherein the first tubular electrode comprises a precious metal chosen from the group consisting of: platinum, palladium, silver, rhodium, and rhenium.

81. A method according to claim 79, wherein the first tubular electrode comprises a porous perovskite.

82. A method of manufacturing an oxygen pump, the method comprising:
extruding a tubular electrolyte layer comprising cerium oxide; and
reducing an outside and an inside surface of the electrolyte layer.

83. A method of manufacturing an oxygen sensor, the method comprising:
extruding a first tubular electrode, capable of supporting the oxygen sensor;
layering an electrolyte layer on the first tubular electrode; and
layering a second tubular electrode on the electrolyte layer.

84. A method according to claim 83, wherein the first tubular electrode comprises a precious metal chosen from the group consisting of: platinum, palladium, silver, rhodium, and rhenium.

85. A method according to claim 83, wherein the first tubular electrode comprises a porous perovskite.

86. A method of manufacturing an oxygen sensor, the method comprising:
extruding a tubular electrolyte layer comprising cerium oxide; and
reducing an outside and an inside surface of the electrolyte layer.

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